

FIG. 1

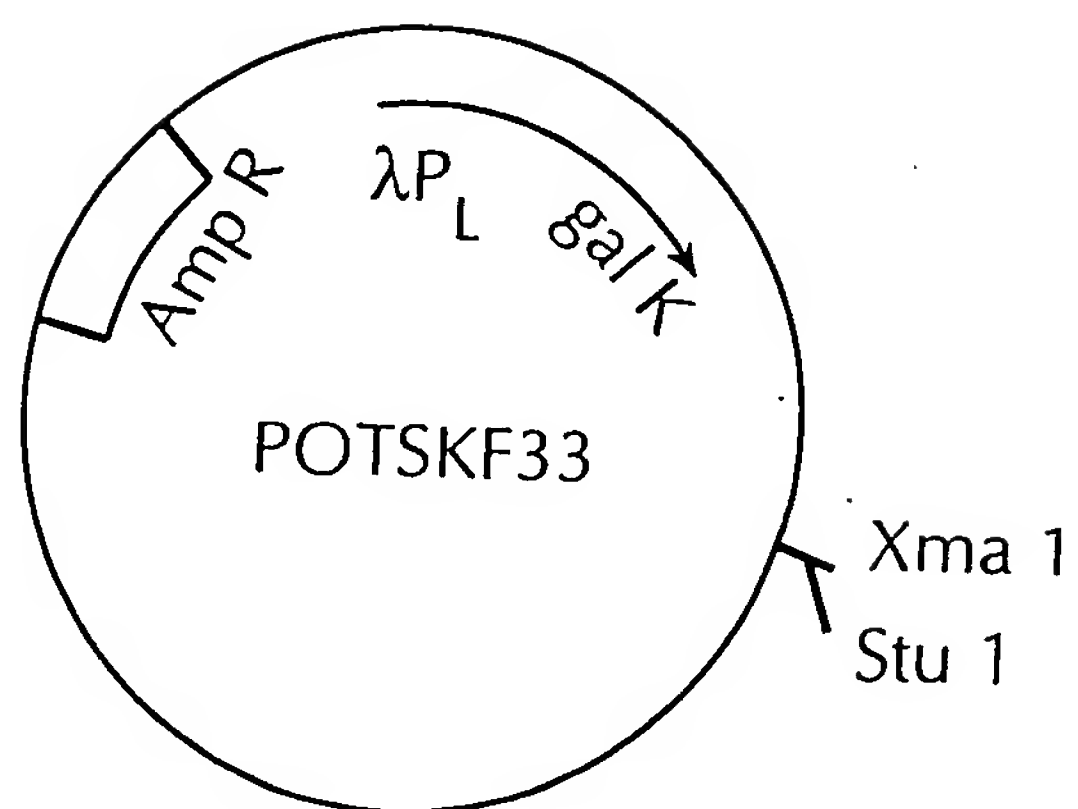
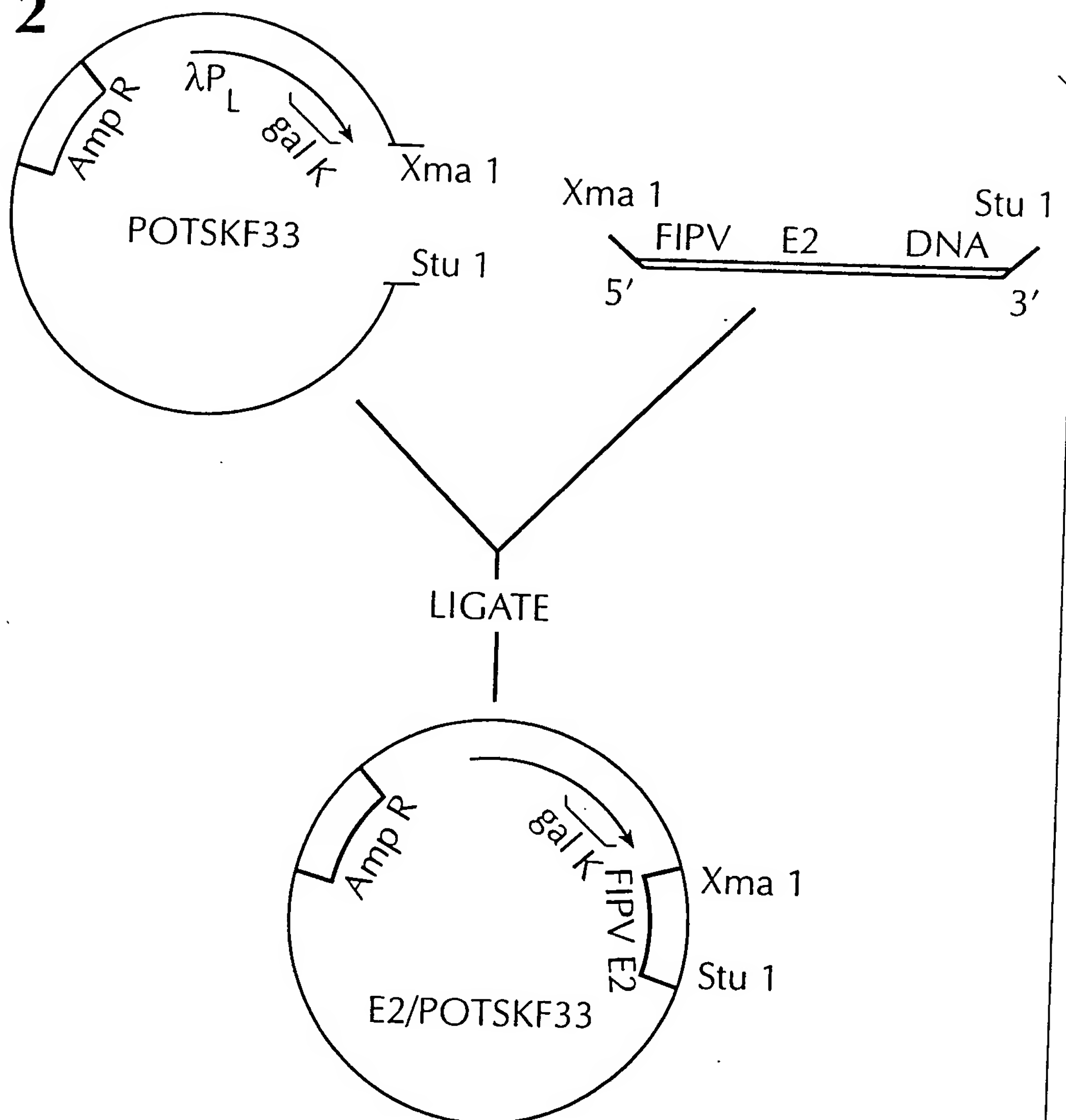


FIG. 2



**FIG. 3A**

**AR58-3 PCR expression clone**

SEQ ID NO: 19- nucleotide sequence

SEQ ID NO: 20- amino acid sequence

ATG GAT CCC GAA TTC CAA GAA AAA ACA CAA TCT CTG TTT	39
Met Asp Pro Glu Phe Gln Glu Lys Thr Gln Ser Leu Phe	
1 5 10	
GCC AAC GCA TTT GGC TAC CCT GCC ACT CAC ACC ATT CAG	78
Ala Asn Ala Phe Gly Tyr Pro Ala Thr His Thr Ile Gln	
15 20 25	
GGC CCT GGC CGC GTG AAT TTG ATT GGT GAA CAC ACC GAC	117
Ala Pro Gly Arg Val Asn Leu Ile Gly Glu His Thr Asp	
30 35	
TAC AAC GAC GGT TTC GTT CTG CCC TGC GCG ATT GAT TAT	156
Tyr Asn Asp Gly Phe Val Leu Pro Cys Ala Ile Asp Tyr	
40 45 50	
CAA ACC GTG ATC CCT AAT ACC CGG GGC ACT GGT AAT GCA	195
Gln Thr Val Ile Pro Asn Thr Arg Gly Thr Gly Asn Ala	
55 60 65	
↑	
first FIPV aa	
CGT GGT AAA CCA TTA TTA TTT CAT GTG CAT GGT GAG CCT	234
Arg Gly Lys Pro Leu Leu Phe His Val His Gly Glu Pro	
70 75	
GTT AGT GTT ATT ATA TAT ATA TCG GCT TAT AGG GAT GAT	273
Val Ser Val Ile Ile Tyr Ile Ser Ala Tyr Arg Asp Asp	
80 85 90	

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# FIG. 4A

DF2 FIPV, nucleotides 1- 4365 [SEQ ID NO:21]  
DF2 FIPV, amino acid 1- 1454 [SEQ ID NO:22]

DF2-HP, nucleotides\* 1- 2246 [SEQ ID NO:23]  
DF2-HP, amino acids\* 1- 748 [SEQ ID NO:24]

ATG ATT GTG CTC GTA ACT TGC CTC TTG TTG TTA TGT TCA TAC CAC ACA 48  
Met Ile Val Leu Val Thr Cys Leu Leu Leu Leu Cys Ser Tyr His Thr  
1 5 10 15

GTT TTG AGT ACA ACA AAT AAT GAA TGC ATA CAA GTT AAC GTA ACA CAA 96  
Val Leu Ser Thr Thr Thr Asn Asn Glu Cys Ile Gln Val Thr Gln  
20 25 30

TTG GCT GGC AAT GAA AAC CTT ATC AGA GAT TTT CTG TTT AGT AAC TTT 144  
Leu Ala Gly Asn Glu Asn Leu Ile Arg Asp Phe Leu Phe Ser Asn Phe  
35 40 45

AAA GAA GAA GGA AGT GTA GTT GTT GGT GGT TAT TAC CCT ACA GAG GTG 192  
Lys Glu Glu Gly Ser Val Val Val Gly Gly Tyr Tyr Pro Thr Glu Val  
50 55 60

TTG TAC AAC TGC TCT AGA ACA GCA CAA ACT ACT GCC TTT CAG TAT TTT 240  
Trp Tyr Asn Cys Ser Arg Thr Ala Gln Thr Thr Ala Phe Phe  
65 70 75 80

AAT AAT ATA CAT GCC TTT TAT TTT GTT ATG GAA GCC ATG GAA AAT AGC 288  
Asn Asn Ile His Ala Phe Tyr Phe Val Met Glu Ala Met Glu Asn Ser  
85 90 95

T\* G\*  
Arg\*

# FIG. 4B

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ACT GGT AAT GCA CGT GGT AAA CCA TTA TTA TTT CAT GTG CAT GGT GAG	336
Thr Gly Asn Ala Arg Gly Lys Pro Leu Leu Phe His Val His Gly Glu	
↑	100
97 of WSU 1146	105
FIPV in 58-3;	
AR58-3 amino acid #62	
CCT GTT AGT GTT ATT ATA TAT ATA TCG GCT TAT AGG GAT GAT GTG CAA	384
Pro Val Ser Val Ile Ile Tyr Ile Ser Ala Tyr Arg Asp Asp Val Gln	
115	120
	125
CAA AGG CCC CTT TTA AAA CAT GGG TTA GTG TGC ATA ACT AAA AAT CGC	432
Gln Arg Pro Leu Leu Lys His Gly Leu Val Cys Ile Thr Lys Asn Arg	
130	140
	Glu*135
CAT ATT AAC TAT GAA CAA TTC ACC TCC AAC CAG TGG AAT TCC ACA TGT	480
His Ile Asn Tyr Glu Gln Phe Thr Ser Asn Gln Trp Asn Ser Thr Cys	
145	150
	↑
	155
	AR58-3
	a.a. #116
	a.a. #118
ACG GGT GCT GAC AGA AAA ATT CCT TTC TCT GTC ATA CCC ACG GAC AAT	528
Thr Gly Ala Asp Arg Lys Ile Pro Phe Ser Val Ile Pro Thr Asp Asn	
165	170
	175
GGA ACA AAA ATC TAT GGT CTT GAG TGG AAT GAT GAC TTT GTT ACA GCT	576
Gly Thr Lys Ile Tyr Gly Leu Glu Trp Asn Asp Asp Phe Val Thr Ala	
180	185
	190
TAT ATT AGT GGT CGT TCT TAT CAC TTG AAC ATC AAT ACT AAT TGG TTT	624
Tyr Ile Ser Gly Arg Ser Tyr His Leu Asn Ile Asn Thr Asn Trp Phe	
195	200
	↑
	205
	AR58-3
	a.a. #164

FIG. 4C

AAC AAT GTC ACA CTT TTG TAT TCA CGC TCA AGC ACT GCT ACC TGG GAA 672 Asn Asn Val Thr Leu Leu Tyr Ser Arg Ser Ser Thr Ala Trp Glu 210 215
TAC AGT GCT GCA TAT GCT TAC CAA GGT GTT TCT AAC TTC ACT TAT TAC 720 Tyr Ser Ala Ala Tyr Ala Tyr Gln Gly Val Ser Asn Phe Thr Tyr Tyr 225 230 235 240
AAG TTA AAT AAC ACC AAT GGT CTA AAA ACC TAT GAA TTA TGT GAA GAT 768 Lys Leu Asn Asn Thr Asn Gly Leu Lys Thr Tyr Glu Leu Cys Glu Asp 245 250 255
TAT GAA CAT TGC ACT GGC TAT GCT ACC AAT GTA TTT GCT CCG ACA TCA 816 Tyr Glu His Cys Thr Gly Gly Ala Thr Asn Val Phe Ala Pro Thr Ser 260 265 270
GGT GGT TAC ATA CCT GAT GGA TTT AGT TTT AAC AAT TGG TTC TTG CTT 864 Gly Gly Tyr Ile Pro Asp Gly Phe Ser Ser Phe Asn Asn Trp Phe Leu Leu 275 280
ACA AAT AGT TCC ACT ACT TTT GTT AGT GGC AGG TTT GTA ACA AAT CAA CCA 912 Thr Asn Ser Ser Thr Phe Phe Val Ser Gly Arg Phe Val Thr Asn Gln Pro 290 295 300
TTA TTG ATT AAT TGC TTG TGG CCA GTG CCC AGT AGT TTT GGT GTA GCA GCA 960 Leu Leu Ile Asn Cys Leu Trp Pro Val Pro Ser Ser Phe Gly Val Ala Ala 305 310 315 320
CAA GAA TTT TGT TTT GAA GGT GCA CAG TTT AGC CAA TGT AAT GGT GTG 1008 Gln Glu Phe Cys Phe Glu Gly Ala Gln Phe Ser Ser Gln Cys Asn Gly Val 325 330 335

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**FIG. 4D**

TCT TTA AAT AAC ACA GTG GAT GTT ATT AGA TTC AAC CTT AAT TTC ACT	1056
Ser Leu Asn Asn Thr Val Asp Val Ile Arg Phe Asn Phe Thr	
	340
C*	
GCA GAT GTA CAA TCT GGT ATG GGT GCT ACA GTA TTT TCA CTG AAT ACA	1104
Ala Asp Val Gln Ser Gly Met Gly Ala Thr Val Phe Ser Leu Asn Thr	
	355
ACA GGT GGT GTC ATT CTT GAA ATT TCA TGT TAT AGT GAC ACA GTG AGT	1152
Thr Gly Gly Val Ile Leu Glu Ile Ser Cys Tyr Ser Asp Thr Val Ser	
	370
GAG TCT AGT TCT TAC AGT TAT GGT GAA GAA ATC CCG TTC GGC ATA ACT GAC	1200
Glu Ser Ser Tyr Ser Tyr Tyr Gly Glu Glu Ile Ile Pro Phe Gly Ile Thr Asp	
	385
GGA CCA CGA TAC TGT TAT GTA CTT TAC TAT GGC AAT GGC ACA GCT CTT AAA TAT	1248
Gly Pro Arg Tyr Cys Tyr Val Val Tyr Tyr Asn Gly Thr Thr Ala Leu Lys Tyr	
	405
TTA GGA ACA TTA CCA CCC AGT GTA AAG GAA ATT GCT ATT AGT AAG TGG	1296
Leu Gly Thr Leu Pro Pro Ser Val Lys Glu Ile Ala Ile Ser Lys Trp	
	420
	425
	430
	415
	410
	395
	390
	375
	360
	365
	350

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FIG. 4E

GGC CAT TTT TAT TAT ATT AAT GGT TAC AAT TTC TTT AGC ACA TTT CCT ATT 1344 Gly His Phe Tyr Tyr Ile Asn Gly Tyr Asn Phe Phe Thr Pro Ile 435 440 445
GGT TGT ATA TCT TTT AAT TTA ACC ACT GGT GCT AGT GGA GCT TTT TGG 1392 Gly Cys Ile Ser Phe Asn Leu Thr Thr Thr Ala Ser Gly Ala Phe Trp 450 455 Val* 460
ACA ATT GCT TAC ACA TCG TAT ACT GAA GCA TTA GTA CAA GTT GAA AAC 1440 Thr Ile Ala Tyr Thr Ser Tyr Thr Glu Ala Leu Val Gln Val Glu Asn 465 470 475
ACA GCT ATT AAA AAT GTG ACG TAT TGT AAC AGT CAC ATT AAT AAC ATT 1488 Thr Ala Ile Lys Asn Val Thr Thr Cys Asn Asn Ser His Ile Asn Asn Ile 485 490 495
AAA TGT TCT CAA CTT ACT GCT AAT TTG AAT AAT GGA TTT TAT CCT GTT 1536 Lys Cys Ser Gln Leu Thr Thr Ala Asn Leu Asn Asn Gly Phe Tyr Pro Val 500 505 510
GCT TCA AGT GAA GTA GGT TTC GTT AAT AAG AGT AGT GTT GTG TTA TTA CCT 1584 Ala Ser Ser Glu Val Gly Phe Val Asn Lys Ser Val Val Leu Leu Pro 515 520 525
AGC TTT TTC ACA CAC ACC GCT GTC AAT ATA ACC ATT GAT CTT GGT ATG 1632 Ser Phe Phe Thr His Thr Tyr* Tyr* Ile Thr Ile Asp Leu Gly Met 530 535 540

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FIG. 4F

AAG CTT AGT GGT TAT GGT CAA CCC ATA GCC TCG ACA CTA AGT AAC ATC	1680
Lys Leu Ser Gly Tyr 550	Ile 560
ACA CTA CCA ATG CAG GAT AAC AAT ACT GAT GTG TAC TGT ATT CGT TCT	1728
Thr Leu Pro Met 565	Arg Ser 575
<b>A*</b>	
AAC CAA TTC TCA GTT TAT TAT GTT CCT CCT TCC ACT TGC AAA AGT TCT TTA TGG	1776
Asn Gln Phe Ser Val Tyr 530	Leu Trp 590
<b>C*</b>	
GAC AAT ATT TTT AAT CAA GAC TGC TGC ACG GAT GAT GGT TTA GAG GCT ACA GCT	1824
Asp Asn Ile Phe Asn Gln Asp 600	Ala Thr Ala 605
GTT ATA AAA ACT GGT ACT TGT CCT TTC TCA TTT GAT AAA TTTG AAC AAT	1872
Val Ile Lys Thr Gly Thr 615	Leu Asn Asn 620
TAC TTG ACT TTT AAC AAG TTT CTT TGT TGT TCG AGT CCT GGT GCT	1920
Tyr Leu Thr Phe Asn Lys 630	Val Gly Ala 640
AAT TGC AAG TTT GAT GAT GCT GCA CGT ACA AGA ACC AAT GAG CAG GTT	1968
Asn Cys Lys Phe Asp 645	Gln Val 655
GTT AGA AGT CTA TAT GTA ATA TAT GAA GAA GGA GAC AAC AAC ATA GTG GGT	2016
Val Arg Ser Leu Tyr Val Ile Tyr 665	Ile Val Gly 670

**FIG. 4G**

G*																
GTA Val	CCG Pro	TCT Ser	GAT Asp	AAT Asn	AGC Ser	GGT Gly	CTG Leu	CAC His	GAT Asp	TTG Leu	TCT Ser	GTG Val	CTA Leu	CAC His	CTA Leu	2064
		675		<b>Asp</b>		680						685				
GAC Asp	TCC Ser	TGT Cys	ACA Thr	GAT Asp	TAC Tyr	AAT Asn	ATA Ile	TAT Tyr	GGT Gly	AGA Arg	ACT Thr	GGT Gly	GTT Val	GGT Gly	ATT Ile	2112
	690					695					700					
ATT Ile	AGA Arg	CGA Arg	ACT Thr	AAC Asn	AGT Ser	ACG Thr	CTA Leu	CTT Leu	AGT Ser	GGC Gly	TTA Leu	TAT Tyr	TAC Tyr	ACA Thr	TCA Ser	2160
705					710					715					720	
CTA Leu	TCA Ser	GGT Gly	GAT Asp	TTG Leu	TTA Leu	GGC Gly	Phe	AAA Lys	AAT Asn	GTT Val	AGT Ser	GAT Asp	GGT Gly	GTC Val	ATT Ile	2208
				725					730					735		
TAT Tyr	TCT Ser	GTG Val	ACG Thr	CCA Pro	TGT Cys	GAT Asp	GTA Val	AGC Ser	GCA Ala	CAA Gln	GCG Ala	GCT Ala	GTT Val	ATT Ile	GAT Asp	2256
			740					745					750			
GGT Gly	GCC Ala	ATA Ile	GTT Val	GGA Gly	GCT Ala	ATG Met	ACT Thr	TCC Ser	ATT Ile	AAC Asn	AGT Ser	GAA Glu	CTG Leu	TTA Leu	GGT Gly	2304
		755					760					765				
CTA Leu	ACA Thr	CAT His	TGG Trp	ACA Thr	ACG Thr	ACA Thr	CCT Pro	AAT Asn	TT~ Ph~	TAT Tyr	TAC Tyr	TAC Tyr	TCT Ser	ATA Ile	TAT Tyr	2352
	770					775					780					
AAT Asn	TAC Tyr	ACA Thr	AGT Ser	GAG Glu	AGG Arg	ACT Thr	CGT Arg	GGC Gly	ACT Tht	GCA Ala	ATT Ile	GAC Asp	AGT Ser	AAC Asn	GAT Asp	2400
785					790					795					800	

**FIG. 4H**

GTT GAT TGT GAA CCT GTC ATA ACC TAT TCT AAT ATA GGT GTT TGT AAA 2448 Val Asp Cys Glu Pro 805 Val Val Ile Thr Tyr Ser Asn Ile Ile Gly Val Cys Lys 815
AAT GGT GCT TTG GTT TTT ATT AAC GTC ACA CAT TCT GAC GGA GAC GTG 2496 Asn Gly Ala Leu Val 820 Phe Ile Asn Val Thr His Ser Asp Gly Asp Val 830
CAA CCA ATT AGC ACT ACT GGT AAT GTC ACG ATA CCT ACA AAT TTT ACC ATA 2544 Gln Pro Ile Ser Thr Thr Gly Asn Val Thr Thr Ile Pro Thr Asn Phe Thr Ile 845
TCT GTG CAA GTT GAA TAC ATG CAG GTT TAC ACT ACT ACA CCA GTA TCA ATA 2592 Ser Val Gln Val Glu Tyr 855 Met Gln Val Tyr Thr Thr Pro Val Ser Ile 860
GAT TGT GCA AGA TAC GTT TGT AAT GGT AAC CCT AGA TGT AAC AAA TTG 2640 Asp Cys Ala Arg Tyr 870 Val Val Cys Asn Gly Asn Pro Arg Cys Asn Lys Leu 880
TTA ACA CAA TAT GTG TCT GCA TGT CAA ACT ACT ATT GAA CAA CAA GCA CTT GCA 2688 Leu Thr Gln Tyr 885 Val Ser Ala Cys Gln Thr Thr Ile Glu Gln Ala Leu Ala 895
ATG GGT GCC AGA CTT GAA ATG AAC ATG GAG GTT GAT TCC ATG TTG TTT GTC 2736 Met Gly Ala Arg Leu 900 Glu Glu Met Glu Val Asp Ser Met Leu Phe Val 910

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# FIG. 4I

TCG GAA AAT AAT GCC CTT AAA TTG GCA TCT GTT GAG GCG TTC AAT AGT ACA 2784	Ser Glu Asn Ala 915	Leu Lys Leu Ala 920	Ser Val Glu Ala 925	Asn Ser Thr
GAA AAT TTA GAT CCT ATT TAC AAA GAA TGG CCT AGC ATA GGT GGT TCT 2832	Glu Asn Leu Asp Pro Ile Tyr 935	Lys Glu Trp Pro 940	Ile Gly Ser	
TGG CTA GGA GGT CTA AAA GAT ATA CTA CCG TCC CAT AAT AGC AAA CGT 2880	Trp Leu Gly Glu Leu Lys Asp Ile Leu Pro Ser His Asn Ser Lys Arg 960			
AAG TAT GGT TCT TCT GCT GAT ATA GAA GAT TTG CTT TTT GAT AAA GTT GTA ACA 2928	Lys Tyr Gly Ser Ala 965	Asp Glu Asp Leu Leu Phe 970	Lys Val Thr 975	
TCT GGT TTA GGT ACA GTT GAT GAA GAT GAT TAT AAA CGT TGT ACT GGT GGT 2976	Ser Gly Leu Gly Thr Val Asp Glu 985	Tyr Lys Arg Cys Thr 990	Gly Gly	
TAC GAC ATA GCA GAC TTG GTG TGT GCT GCT CAA TAT TAC AAT GGC ATC ATG 3024	Tyr Asp Ile Ala Asp Leu Val Cys Ala 1000	Tyr Gln Tyr Tyr Asn Gly 1005	Ile Met	
GTT CTA CCA GGT GTA GCT AAT GCT GAC AAG ATG ACT ATG TAC ACA GCA 3072	Val Leu Pro Gly Val Ala Asn Ala 1015	Lys Met Thr 1020	Thr Ala	
TCA CTT GCA GGT GGT ATA ACA TTA GGT GCA CTT GGT GGT GCC GTG 3120	Ser Leu Ala Gly Gly Ile Thr Leu Gly Ala 1030	Leu Gly Ala 1035	Gly Ala Val 1040	

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**FIG. 4J**

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GCT ATA CCT TTT GCA GTA GCA CAG GCT AGA CTT AAT TAT GTT GCT	3168
Ala Ile Pro Phe Ala Val Ala Val Gln Ala Arg Leu Asn Tyr Val Ala	1055
	1045
CTA CAA ACT GAT GTA TTG AAT AAA AAC CAA CAG ATC CTG GCT AAT GCT	3216
Leu Gln Thr Asp Val Leu Asn Lys Asn Gln Gln Ile Leu Ala Asn Ala	1070
	1065
TTC AAT CAA GCT ATT GGT AAC ATT ACA CAG GCT TTT GGT AAG GTT AAT	3264
Phe Asn Gln Ala Ile Gly Asn Ile Thr Gln Ala Phe Gly Lys Val Asn	1085
	1080
GAT GCT ATA CAT CAA ACA TCA CAA GGT CTT GCC ACT GTT GCT AAA GCG	3312
Asp Ala Ile His Gln Thr Ser Gln Gly Leu Ala Thr Val Ala Lys Ala	1100
	1095
TTG GCA AAA GTG CAA GAT GTT GTC AAC ACA CAA GGG CAA GCT TTA AGT	3360
Leu Ala Lys Val Gln Asp Val Val Val Asn Thr Gln Gly Gln Ala Leu Ser	1115
	1110
CAC CTT ACA GTA CAA TTG CAA AAT AAT TTT CAA GCC ATT AGT AGT TCT	3408
His Leu Thr Val Gln Leu Gln Asn Asn Phe Gln Ala Ile Ser Ser Ser	1135
	1130
ATT AGT GAT ATT TAT AAC AGG CTT GAC GAA CTG AGT GCT GAT GCA CAA	3456
Ile Ser Asp Ile Tyr Asn Arg Leu Asp Asp Glu Leu Ser Ala Asp Ala Gln	1145
	1140
GTT GAT AGG CTG ATT ACA GGT AGA CTT ACA GCA CTT AAT GCA TTT GTG	3504
Val Asp Arg Leu Ile Thr Gly Arg Leu Thr Ala Leu Asn Ala Phe Val	1160
	1155
	1165

**FIG. 4K**

[illegible]

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# FIG. 4L

ATT GAC ATT AAT CAA ACT GTT CAA GAC ATA TTA GAA AAT TAC AGA CCA 3984	Ile Asp Ile Asn Gln Thr Val Gln Asp Ile Leu Glu Asn Tyr Arg Pro 1315 1320 1325
AAC TGG ACT GTA CCT GAA TTT ACA CTT GAT ATT TTC AAC GCA ACC TAT 4032	Asn Trp Thr Val Pro Glu Phe Thr Leu Asp Ile Phe Asn Ala Thr Tyr 1330 1335 1340
TTA AAT CTG ACT GGT GAA ATT GAT GAC TTA GAG TTT AGG TCA GAA AAG 4080	Leu Asn Leu Thr Gly Glu Ile Asp Asp Leu Glu Phe Arg Ser Glu Lys 1345 1350 1355 1360
CTA CAT AAC ACT ACA GTA GAA CTT GCC ATT CTC ATT GAT ACC ATT AAT 4128	Leu His Asn Thr Thr Val Glu Glu Leu Ala Ile Leu Ile Asp Thr Ile Asn 1365 1370 1375
AAT ACA TTA GTC AAT CTT GAA TGG CTC AAT AGA ATT GAA ACT TAT GTA 4176	Asn Thr Leu Val Val Asr Leu Glu Trp Leu Asn Arg Ile Glu Thr Tyr Val 1380 1385 1390
AAA TGG CCT TGG TAT GTG TGG CTA CTG ATA GGT CTA GTA GTA TTT 4224	Lys Trp Pro Trp Trp Tyr Val Trp Leu Leu Ile Gly Leu Val Val Phe 1395 1400 1405
TGC ATA CCA TTA CTG CTA TTT TGC TGT TTT AGC ACA GGT TGT TGT GGA 4272	Cys Ile Pro Leu Leu Leu Phe Cys Cys Phe Ser Thr Gly Cys Cys Gly 1410 1415 1420
TGC ATA GGT TGT TTA GGA AGT TGT TGT CAC TCT ATA TGT AGT AGA AGA 4320	Cys Ile Gly Cys Leu Gly Ser Cys Cys His Ser Ile Cys Ser Arg Arg 1425 1430 1435 1440
CAA TTT GAA TAT TAT GAA CCA ATT GAA AAA GTG CAT GTC CAC 4362	Gln Phe Glu Tyr Tyr Glu Pro Ile Glu Lys Val His Val His 1445 1450
TAA	4365



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FIG. 5A

TS FIPV, nucleotides 1- 4365 [SEQ ID NO: 25]  
TS FIPV, amino acids 1- 1454 [SEQ ID NO: 26]

TS-BP, nucleotides\* 1- 2246 [SEQ ID NO:27]  
TS-BP, amino acids\* 1- 748 [SEQ ID NO:28]

ATG	ATT	GTG	CTC	GTA	ACT	TGC	CTC	TTG	TTG	TTA	TGT	TAC	CAC	ACA	48
Met	Ile	Val	Leu	Val	Thr	Cys	Leu	Leu	Leu	Leu	Cys	Tyr	His	Thr	
1				5				10					15		
GTT	TTG	AGT	ACA	ACA	AAT	AAT	GAA	TGC	ATA	CAA	GTT	AAC	GTT	ACA	96
Val	Leu	Ser	Thr	Thr	Asn	Asn	Glu	Cys	Ile	Gln	Val	Asn	Val	Thr	
				20				25					30		
TTG	GCT	GGC	AAT	GAA	AAC	CTT	ATC	AGA	GAT	TTT	CTG	TTT	AGT	AAC	144
Leu	Ala	Gly	Asn	Glu	Asn	Leu	Ile	Arg	Asp	Phe	Leu	Phe	Ser	Asn	
				35			40					45			
AAA	GAA	GAA	GGA	AGT	GTA	GTT	GTT	GGT	GGT	TAT	TAC	CCT	ACA	GAG	192
Lys	Glu	Glu	Gly	Ser	Val	Val	Val	Gly	Gly	Tyr	Tyr	Pro	Thr	Glu	
				50		55					60				
TGG	TAC	AAC	TGC	TCT	AGA	ACA	GCT	CGA	ACT	ACT	GCC	TTT	CAG	TAT	240
Trp	Tyr	Asn	Cys	Ser	Arg	Thr	Ala	Arg	Thr	Thr	Ala	Phe	Gln	Tyr	
65					70					75					80
AAT	AAT	ATA	CAT	GCC	TTT	TAT	TTT	GTT	ATG	GAA	GCC	ATG	GAA	AAT	288
Asn	Asn	Ile	His	Ala	Phe	Tyr	Phe	Val	Met	Glu	Ala	Met	Glu	Asn	
				85					90						95



# FIG. 5B

ACT GGT AAT GCA CGT GGT AAA CCA TTA TTA TTT CAT GTG CAT GGT GAG	336
Thr Gly Asn Ala Arg Gly Lys Pro Leu Leu Phe His Val His Gly Glu	110
↑	100
97 of WSU 1146	105
FIPV in 58-3	
corresponds to amino acid #62 of AR58-3	
CCT GTT AGT GTT ATT ATA TAT ATA TCG GCT TAT AGG GAT GAT GTG CAA	384
Pro Val Ser Val Ile Ile Tyr Ile Ser Ala Tyr Arg Asp Asp Val Gln	125
115	120
CAA AGG CCC CTT TTA AAA CAT GGG TTA GTG TGC ATA ACT AAA AAT CGC	432
Gln Arg Pro Leu Leu Lys His Gly Leu Val Cys Ile Thr Lys Asn Arg	140
130	135
CAT ATT AAC TAT GAA CAA TTC ACC TCC AAC CAG TGG AAT TCC ACA TGT	480
His Ile Asn Tyr Glu Gln Phg Thr Ser Asn Gln Trp Asn Ser Thr Cys	160
145	150
↑	155
AR58-3	AR58-3
a.a. #116	a.a. #118
ACG GGT GCT GAC AGA AAA ATT CCT TTC TCT GTC ATA CCC ACG GAC AAT	528
Thr Gly Ala Asp Arg Lys Ile Pro Phe Ser Val Ile Pro Thr Asp Asn	175
165	170
GGA ACA AAA ATC TAT GGT CTT GAG TGG AAT GAT GAC TTT GTT ACA GCT	576
Gly Thr Lys Ile Tyr Gly Leu Glu Trp Asn Asp Phe Val Thr Ala	190
180	185

# FIG. 5C

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TAT ATT AGT GGT CGT TCT TAT CAC TTG AAC ATC AAT ACT AAT TGG TTT	624
Tyr Ile Ser Gly Ara Ser Tyr His Leu Asn Ile Asn Thr Asn Trp Phe	
195	200
	205
AAC AAT GTC ACA CTT TTG TAT TCA CGC TCA AGC ACT GCT ACC TGG GAA	672
Asn Asn Val Thr Leu Leu Tyr Ser Ara Ser Ser Thr Ala Thr Trp Glu	
210	215
	220
	↑
FIPV amino acid	
#223 from WSU 1146;	
AR58-3 a.a. #189	
TAC AGT GCT GCA TAT GCT TAC CAA GGT GGT TCT AAC TTC ACT TAT TAC	720
Tyr Ser Ala Ala Tyr Tyr Ala Tyr Gln Gly Val Ser Asn Phe Thr Tyr Tyr	240
225	235
AAG TTA AAT AAC ACC AAT GGT CTA AAA ACC TAT GAA TTA TGT GAA GAT	768
Lys Leu Asn Asn Thr Asn Gly Leu Lys Thr Tyr Glu Leu Cys Glu Asp	255
	250
TAT GAA CAT TGC ACT GGC TAT GCT ACC AAT GTA TTT GCT CCG ACA TCA	816
Tyr Glu His Cys Thr Gly Thr Ala Tyr Ala Thr Asn Val Phe Ala Pro Thr Ser	270
	265
GGT GGT TAC ATA CCT GAT GGA TTT AGT TTT AAT AAT TGG TTC TTG CTT	864
Gly Gly Tyr Ile Pro Pro Asp Gly Phe Ser Phe Asn Asn Trp Phe Leu Leu	285
	280
ACA AAT AGT TCC ACT ACT TTT GTT AGT GGC AGG TTT GTA ACA AAT CAA CCA	912
Thr Asn Ser Ser Thr Phe Phe Val Ser Gly Arg Phe Val Thr Asn Gln Pro	300
290	295

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FIG. 5D

TTA	TTG	ATT	AAT	TGC	TTG	TGG	CCA	GTG	CCC	AGT	TTT	GGT	GTA	GTA	GCA	960
Leu	Leu	Ile	Asn	Cys	Leu	Trp	Pro	Val	Pro	Ser	Phe	Gly	Val	Val	Ala	
305					310					315					<b>Ala*</b>	320
CAA	GAA	TTT	TGT	TTT	GAA	GGT	GCA	CAG	TTT	AGC	CAA	TGT	AAT	GGT	GTG	1008
Gln	Glu	Phe	Cys	Phe	Glu	Gly	Ala	Gln	Phe	Ser	Gln	Cys	Asn	Gly	Val	
				325					330					335		
TCT	TTA	AAT	AAC	ACA	GTG	GAT	GTT	ATT	AGA	TTC	AAC	CTT	AAT	TTC	ACT	1056
Ser	Leu	Asn	Asn	Thr	Val	Asp	Val	Ile	Arg	Phe	Asn	Leu	Asn	Phe	Thr	
			340					345					350			
GCA	GAT	GTA	CAA	TCT	GGT	ATG	GGT	GCT	ACA	GTA	TTT	TCA	CTG	AAT	ACA	1104
Ala	Asp	Val	Gln	Ser	Gly	Met	Gly	Ala	Thr	Val	Phe	Ser	Leu	Asn	Thr	
		355					360					365				
ACA	GGT	GGT	GTC	ATT	CTT	GAA	ATT	TCA	TGT	TAT	AGT	GAC	ACA	GTG	AGT	1152
Thr	Gly	Gly	Val	Ile	Leu	Glu	Ile	Ser	Cys	Tyr	Ser	Asp	Thr	Val	Ser	
	370					375					380					
GAG	TCT	AGT	TCT	TAC	AGT	TAT	GGT	GAA	ATC	CCG	TTC	GGC	ATA	ACT	GAC	1200
Glu	Ser	Ser	Ser	Tyr	Ser	Tyr	Gly	Glu	Ile	Pro	Phe	Gly	Ile	Thr	Asp	
385					390					395					400	
GGA	CCA	CGA	TAC	TGT	TAT	GTA	CTT	TAC	AAT	GGC	ACA	GCT	CTT	AAA	TAT	1248
Gly	Pro	Arg	Tyr	Cys	Tyr	Val	Leu	Tyr	Asn	Gly	Thr	Ala	Leu	Lys	Tyr	
				405					410					415		
TTA	GGA	ACA	TTA	CCA	CCC	AGT	GTA	AAG	GAA	ATT	GCT	ATT	AGT	AAG	TGG	1296
Leu	Gly	Thr	Leu	Pro	Pro	Ser	Val	Lys	Glu	Ile	Ala	Ile	Ser	Lys	Trp	
			420					425					430			

FIG. 5E

GCC CAT TTT TAT TAT ATT AAT GGT TAC AAT TTC TTT AGC ACA TTT CCT ATT ATT 1344	Gly His Phe Tyr Ile Asn Gly Tyr Asn Phe Phe Ser Thr Phe Pro Ile	435	440	445	
GAT TGT ATA TCT TTT AAT TTA ACC ACT ACT GGT GTT AGT GGA GCT TTT TGG 1392	ASP Cys Ile Ser Phe Asn Leu Thr Thr Gly Val Ser Gly Ala Phe Trp	450	455	460	
ACA ATT GCT TAC ACA TCG TAT ACT GAA GCA TTA GTA CAA GTT GAA AAC 1440	Thr Ile Ala Tyr Thr Ser Thr Tyr Thr Glu Ala Leu Val Gln Val Glu Asn	465	470	475	480
ACA GCT ATT AAA AAT GTG TAT TGT AAC AGT CAC ATT AAT AAC ATT 1488	Thr Ala Ile Lys Asn Val Thr Thr Cys Asn Ser His Ile Asn Asn Ile		485	490	495
AAA TGT TCT CAA CTT ACT GCT AAT TTG AAT AAT GGA TTT TAT CCT GTT 1536	Lys Cys Ser Gln Leu Thr Thr Ala Thr Tyr Tyr A9n Gly Phe Tyr Pro Val	500	505	510	
GCT TCA AGT GAA GTA GGT TTC GCT AAT AAT AAG AGT GTT GTG TTA CCT 1584	Ala Ser Ser Glu Val Gly Phe Val Asn Lys Ser Val Val Leu Leu Pro	515	520	525	
AGC TTT TTC ACA TAC ACC GCT GTC AAT ATA ACC ATT GAT CTT GGT ATG 1632	Ser Phe Phe Thr Tyr Thr ACC GCT Ala Val Asn Ile Thr Ile Asp Leu Gly Met	530	535	540	
AAG CTT AGT GGT TAT GGT CAA CCC ATA GCC TCG ACA CTA AGT AAC ATC 1680	Lys Leu Ser Gly Tyr GGT Gly Pro Ile Ala Ser Thr Leu Ser Asn Ile		545	550	555
					560

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**FIG. 5F**

ACA CTA CCA ATG CAG GAT AAC AAT ACT GAT GTG TAC TGT ATT CGT TCT 1728	Thr Leu Pro Met 565	Gln Asp 570	Val Tyr Cys Ile Arg Ser 575
AAC CAA TTC TCA GTT TAT GTT CAT TCC ACT TGC AAA AGT TCT TTA TGG 1776	Asn Gln Phe Ser 580	Tyr Val His Ser 585	Cys Lys Ser 590
GAC AAT ATT TTT AAT CAA GAC TGC ACG GAT GTT TTA GAG GCT ACA GCT 1824	Asn Ile Phe 595	Gln Asp 600	Thr Ala Thr Ala 605
GTT ATA AAA ACT GGT ACT ACT TGT CCT TTC TCA TCA TTT GAT AAA TTG AAC AAT 1872	Ile Lys Thr Gly 610	Thr Cys Pro Phe Ser 615	Leu Asn Asn 620
TAC TTG ACT TTT AAC ACG Thr Phe Cys Lys 630	<b>A*</b>		
Tyr Leu Thr Phe Asn 625	<b>Lys*</b>		
AAT TGC AAG TTT GAT GTT GCT GCA CGT ACA AGA ACC AAT AAT GAG CAG GTT 1968	Asn Cys Lys Phe Asp 645	Val Ala Ala Arg 650	Gln Val 655
GTT AGA AGT CTA TAT ATA ATA TAT GAA GAA GGA GAC AAC AAC ATA GTG GGT 2016	Val Arg Ser 660	Ile Ile Tyr Glu 665	Ile Val Gly 670
	<b>G*</b>		
	<b>Val*</b>		

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**FIG. 5H**

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GTT GAT TGT GAA CCT GTC ATA ACC TAT TCT AAT ATA GGT GTT TGT AAA 2448	Val Asp Cys Glu Pro Val Ile Thr Tyr Ser Asn Ile Gly Val Cys Lys 815
AAT GGT GCT TTG GTT TTT ATT AAC GTC ACA CAT TCT GAC GGA GAC GTG 2496	Asn Gly Ala Leu Val Phe Ile Asn Val Thr His Ser Asp Gly Asp Val 830
CAA CCA ATT AGC ACT GGT AAT GTC ACG ATA CCT ACA AAT TTT ACC ATA 2544	Gln Pro Ile Ser Thr Gly Asn Val Thr Ile Pro Thr Asn Phe Thr Ile 845
TCT GTG CAA GTT GAA TAC ATG CAG GTT TAC ACT ACA CCA GTA TCA ATA 2592	Ser Val Gln Val Glu Tyr Met Gln Val Tyr Thr Thr Pro Val Ser Ile 860
GAT TGT GCA AGA TAC GTT TGT AAT GGT AAC CCT AGA TGT AAC AAA TTG 2640	Asp Cys Ala Arg Tyr Val Cys Asn Gly Asn Pro Arg Cys Asn Lys Leu 880
TTA ACA CAA TAT GTG TCT GCA TGT CAA ACT ATT GAA CAA GCA CTT GCA 2688	Leu Thr Gln Tyr Val Ser Ala Cys Gln Thr Thr Ile Glu Gln Ala Leu Ala 895
~TG GGT GCC AGA CTT GAA AAC ATG GAG GTT GAT TCC ATG TTG TTT GTC 2736	Met Gly Ala Arg Leu Glu Glu Met Glu Val Asp Ser Met Leu Phe Val 910
TCG GAA AAT GCC CTT AAA TTG GCA TCT GTT GAG GCG TTC AAT AGT ACA 2784	Ser Glu Asn Ala Leu Lys Leu Ala Ser Val Glu Glu Ala Phe Asn Ser Thr 925



FIG. 5I

GAA AAT TTA GAT CCT ATT TAC AAA GAA TGG CCT AGC ATA GGT GGT TCT 2832	Glu Asn Leu Asp Pro Ile Tyr 935	AAA Lys Glu Trp Pro Ser Ile Gly Ser	940
TGG CTA GGA GGT CTA AAA GAT ATA CTA CCG TCC CAT AAT AGC AAA CGT 2880	Trp Leu Gly Gly Leu Lys Asp Ile Leu Pro 955	His Ser Lys Arg 960	
AAG TAT GGT TCT GCT ATA GAA GAT TTG CTT TTT GAT AAA GTT GTA ACA 2928	Lys Tyr Gly Ser Ala Ile Ile Glu Asp Leu Leu Phe Asp Lys Val Thr 975		
TCT GGT TTA GGT ACA GTT GAT GAA GAT GAT TAT TAT AAA CGT TGT ACT GGT GGT 2976	Ser Gly Leu 980		
TAC GAC ATA GCA GAC TTG GTG TGT GCT CAA TAT TAC AAT GGC ATC ATG 3024	Tyr Asp Ile Ala Asp Leu Leu Val Cys Ala Gln Tyr Tyr Asn Gly Ile Met 1005		
GTT CTA CCA GGT GTA GCT AAT GCT GAC AAG ATG ACT ATG TAC ACA GCA 3072	Val Leu Pro Gly Val Ala Asn Ala Asp Lys Met Thr Met Tyr Thr Ala 1010 1015 1020		
TCA CTT GCA GGT GGT ATA ACA TTA GGT GCA CTT GGT GGT GCC GTG 3120	Ser Leu Ala Gly Gly Ile Thr Leu Gly Ala Leu Gly Gly Ala Val 1025 1030 1035 1040		
GCT ATA CCT TTT GCA GTA GCA GTA CAG GCT AGA CTT AAT TAT GTT GCT 3168	Ala Ile Pro Phe Ala Val Ala Val Gln Ala Arg Leu Asn Tyr Val Ala 1045 1050 1055		

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FIG. 5J

CTA CAA ACT GAT GTA TTG AAT AAA AAC CAA CAG ATC CTG GCT AAT GCT	3216
Leu Gln Thr Asp Val 1060	
	1065
	1070
TTC AAT CAA GCT ATT GGT AAC ATT ACA CAG GCT TTT GGT AAG GTT AAT	3264
Phe Asn Gln Ala Ile Gly Asn Ile Thr Gln Ala Phe Gly Lys Val Asn	
	1080
	1085
GAT GCT ATA CAT CAA ACA TCA CAA GGT CTT GCC ACT GTT GCT AAA GCG	3312
Asp Ala Ile His Gln Thr Ser Gln Gly Leu Ala Thr Val Ala Lys Ala	
	1090
	1095
	1100
TTG GCA AAA GTG CAA GAT GTT GTC AAC ACA CAA GGG CAA GCT TTA AGT	3360
Leu Ala Lys Val Gln Asp Val 1110	
	1115
	1120
CAC CTT ACA GTA CAA TTG CAA AAT AAT TTT CAA GCC ATT AGT AGT TCT	3408
His Leu Thr Val Gln Leu Gln Asn Phe Gln Ala Ile Ser Ser Ser	
	1125
	1130
	1135
ATT AGT GAT ATT TAT AAC AGG CTT GAC GAA CTG AGT GCT GAT GCA CAA	3456
Ile Ser Asp Ile Tyr Asn Arg Leu Asp Glu Leu Ser Ala Asp Ala Gln	
	1140
	1145
	1150
GTT GAT AGG CTG ATT ACA GGT AGA CTT ACA GCA CTT AAT GCA TTT GTG	3504
Val Asp Arg Leu Ile Thr Arg Gly Arg Leu Thr Ala Leu Asn Ala Phe Val	
	1155
	1160
	1165
TCT CAG ACT CTA ACC AGA CAA GCA GAG GTT AGG GCT AGT AGA CAA CTT	3552
Ser Gln Thr Leu Thr Arg Gln Ala Glu Val Arg Ala Ser Arg Gln Leu	
	1170
	1175
	1180

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FIG. 5K

GCC AAA	GAC AAG	GTT AAT	GAA TGT	GTT AGG	TCT CAG	TCT CAG	AGA TTC	3600
Ala Lys	Asp Lys	Val Asn	Glu Cys	Val Arg	Gln Ser	Gln Ser	Arg Phe	
1185		1190		1195			1200	
GGA TTC	TGT GGT	AAT GGT	ACA CAT	TTG TTT	TCA CTA	GCA AAT	GCA GCA	3648
Gly Phe	Cys Gly	Asn Gly	Thr His	Leu Leu	Phe Ser	Ala Asn	Ala Ala	
		1205		1210			1215	
CCA AAT	GGC ATG	ATT TTC	TTT CAT	ACA GTA	CTA TTA	CCA ACA	GCT TAT	3696
Pro Asn	Gly Met	Ile Phe	His Phe	Thr Val	Leu Leu	Pro Thr	Ala Tyr	
	1220			1225			1230	
GAA ACT	GTA ACA	GCT TGG	TCA GGT	ATT TGT	GCT TCA	GAT GGC	GAT CGC	3744
Glu Thr	Val Thr	Ala Ala	Trp Ser	Gly Ile	Cys Ala	Asp Gly	Asp Arg	
	1235			1240			1245	
ACT TTC	GGA CTT	GTC GTT	AAA GAT	GTG CAG	TTG ACG	TTT TTT	CGT AAT	3792
Thr Phe	Gly Leu	Val Val	Lys Asp	Val Gln	Thr Leu	Phe Phe	Arg Asn	
	1250		1255			1260		
CTA GAT	GAC AAG	TTC TAT	TTG ACC	CCC AGA	ACT ATG	TAT CAG	CCT AGA	3840
Leu Asp	Asp Lys	Phe Phe	Leu Thr	Pro Arg	Thr Met	Tyr Tyr	Pro Arg	
1265		1270		1275			1280	
GTT GCA	ACT AGT	TCT GAT	TTT GTT	CAA ATT	GAA GGG	TGT GAT	GTG TTG	3888
Val Ala	Thr Ser	Ser Ser	Asp Phe	Val Val	Gln Glu	Cys Asp	Val Leu	
		1285		1290			1295	
TTT GTC	AAC GAG	ACT GTA	ATT GAT	TTG CCT	AGT ATT	ATA CCT	GAC TAT	3936
Phe Val	Asn Ala	Thr Val	Ile Asp	Leu Pro	Ser Ile	Ile Pro	Asp Tyr	
		1300		1305			1310	

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# FIG. 5L

ATT GAC ATT AAT CAA ACT GTT CAA GAC ATA TTA GAA AAT TAC AGA CCA	3984
Ile Asp Ile Asn Gln Thr Val Gln Asp Ile Leu Glu Asn Tyr Arg Pro	
1315 1320 1325	
AAC TGG ACT GTA CCT GAA TTT ACA CTT GAT ATT TTC AAC ACC TAT	4032
Asn Trp Thr Val Pro Glu Phe Thr Leu Asp Ile Phe Asn Thr Tyr	
1330 1335 1340	
TTA AAT CTG ACT GGT GAA ATT GAT GAC TTA GAG TTT AGG TCG GAA AAG	4080
Leu Asn Leu Thr Gly Glu Ile Asp Asp Leu Glu Phe Arg Ser Glu Lys	
1345 1350 1355 1360	
CTA CAT AAC ACT ACA GTA GAA CTT GCC ATT CTC ATT GAT AAC ATT AAT	4128
Leu His Asn Thr Thr Val Glu Glu Ala Ile Leu Ile Asp Asn Ile Asn	
1365 1370 1375	
AAT ACA TTA GTC AAT CTT GAA TGG CTC AAT AGA ATT GAA ACT TAT GTA	4176
Asn Thr Leu Val Asn Asn Leu Glu Trp Leu Asn Arg Ile Glu Thr Tyr Val	
1380 1385 1390	
AAA TGG CCT TGG TAT GTG TGG CTA CTG ATA GGT TTA GTA GTA TTT	4224
Lys Trp Pro Trp Tyr Val Trp Leu Leu Ile Gly Leu Val Val Phe	
1395 1400 1405	
TGC ATA CCA TTA CTG CTA TTT TGC TGT TTT AGC ACA GGT TGT TGT GGA	4272
Cys Ile Pro Leu Leu Leu Phe Cys Cys Phe Ser Thr Gly Cys Cys Gly	
1410 1415 1420	
TGC ATA GGT TGT TTA GGA AGT TGT TGT CAC TCT ATA TGT AGT AGA AGA	4320
Cys Ile Gly Cys Leu Glu Gly Ser Cys Cys His Ser Ile Cys Ser Arg	
1425 1430 1435 1440	
CAA TTT GAA AAT TAT GAA CCA ATT GAA AAA GTG CAT GTC CAC	4362
Gln Phe Glu Asn Tyr Glu Pro Ile Glu Lys Val His Val His	
1445 1450	
TAA	4365

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FIG. 6

TN406, nucleotides 302 - 671 [SEQ ID NO:29]		TN406, amino acids 102 - 223 [SEQ ID NO:30]	
GT GGT AAA CCA TTA TTA TTT CAT GTG CAT GGT GAG CCT	339	GLY Lys Pro Leu Leu Phe His Val His GLY Glu Pro	102
			106
			111
GTT AGT GTT ATT ATA TAT ATA TCG GCT TAT AGG GAT GAT	378	Val Ser Val Ile Ile Tyr Ile Ser Ala Tyr Arg Asp Asp	116
			121
			126
GTG CAA CAA AGG CCC CTT TTA AAA CAT GGG TTA GTG TGC	417	Val Gln Gln Arg Pro Leu Leu Lys His GLY Leu Val Cys	131
			136
ATA ACT AAA AAT CGC CAT ATT AAC TAT GAA CAA TTC ACC	456	Ile Thr Lys Asn Arg His Ile Asn Tyr Glu Gln Phe Thr	141
			146
			151
TCC AAC CAG TGG AAT.TCC ACA TGT ACG GGT GCT GAC AGA	495	Ser Asn Gln Trp Asn Ser Thr Cys Thr GLY Ala Asp Arg	156
			161
AAA ATT CCT TTC TCT GTC ATA CCC ACG GAC AAT GGA ACA	534	Lys Ile Pro Phe Ser Val Ile Pro Thr Asp Asn GLY Thr	171
			176
AAA ATC TAT GGT CTT GAG TGG AAT GAT GAC TTT GTT ACA	573	Lys Ile Tyr GLY Leu Glu Trp Asn Asp Asp Phe Val Thr	181
			186
			191
GCT TAT ATT AGT GGT CGT TCT TAT CAC TTG AAC ATC AAT	612	Ala Tyr Ile Ser Ser GLY Arg Ser Tyr His Leu Asn Ile Asn	196
			201
ACT AAT TGG TTT AAC AAT GTC ACA CTT TTG TAT TCA CGC	651	Thr Asn Trp Phe Asn Asn Val Thr Leu Leu Tyr Ser Arg	211
			216
			221
TCA AGC ATT GCT ACC TGG GA	671	Ser Ser Ile Ala Thr Trp	221

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# FIG. 7A

FECV, Nucleotides 1- 4365 [SEQ ID NO:31]  
 FECV, amino acids 1- 1454 [SEQ ID NO:32]

ATG ATT GTG CTC GTA ACT TGC CTC TTG TTG TTA TGC TCG TAC CAC ACT	48
Met Ile Val Leu Val Thr Cys Leu Leu Leu Cys Ser Tyr His Thr	15
1	
GTT TCG AGT ACG TCA AAC AAT GAT TGT AGA CAA GTT AAC GTA ACA CAA	96
Val Ser Ser Thr Ser Asn Asn Asp Cys Arg Gln Val Thr Gln	30
20	
TTA GCT GGC AAT GAA AAC AAC CTT ATT AGA GAC TTT TTG TTT CAA AGT TTT	144
Leu Ala Gly Asn Glu Asn Leu Ile Arg Asp Phe Leu Phe Ser Phe	45
35	
AAA GAA GAA GGA ATT GTA GTT GTT GGT GGT TAT TAC TAC ACA GAG GTG	192
Lys Glu Glu Gly Ile Val Val Val Gly Gly Tyr Tyr Pro Thr Glu Val	60
50	
TGG TAC AAC TGC TCT AGA ACA GCA ACT ACT ACC ACT Thr Thr 75	240
Trp Tyr Asn Cys Ser Arg Thr Ala Thr Thr Thr Tyr Tyr Phe	80
65	
AAT AAT ATA CAT GCC TTT TAT TTT GAT ATG GAA GCT ATG GAA AAT AGC	288
Asn Asn Ile His Ala Phe Tyr Phe Asp Met Glu Ala Met Glu Asn Ser	95
85	
ACT GGT AAT GCA CGT GGT AAA CCT CTA TTA TTT CAT GTT CAT GGT GAA	336
Thr Gly Asn Ala Arg Gly Lys Pro Leu Leu Phe His Val His Gly Glu	110
100	
97 of WSU 1146	
amino acid #62 of AR58-3	

FIG. 7B

CCT GTT AGT ATC ATC ATA TAT ATA TCA GCT TAT GGG GAT GAT GTG CAA 384	Pro Val Ser Ile Ile Ile Ile Tyr Tyr Ile Ser Ser Ala Tyr Tyr Gly Asp Asp Val Gln
CAA AGG CCA CTT TTA GAA CAT GGG TTA TTG TGC ATT ACT AAA AAT AAT CGC 432	Gln Arg Pro Leu Leu Glu Glu His Gly Leu Leu Cys Ile Thr Lys Asn Arg
AAT ATT GAC TAT AAC ACC TTC ACC AGC AAC CAG TGG GAT TCC ATA TGT 480	Asn Ile Asp Tyr Asn Thr Phe Thr Ser Ser Asn Gln Trp Asp Ser Ile Cys
ACG GGT AAT GAC AGA AAA ATT CCT TTC TCT GTC ATA CCC AGG GAT AAT 528	Thr Gly Asn Asp Arg Lys Ile Ile Pro Phe Ser Val Ile Ile Pro Arg Asp Asn
GGA ACA AAA ATC TAT GGG CTT GAG GAT TGG AAT GAT GAT GAA TTT GTT ACA GCG 576	Gly Thr Lys Ile Tyr Tyr Gly Leu Leu Glu Glu Trp Asn Asp Asp Val Thr Ala
TAT ATT AGT GGT CGT TCT TAT TAT TAT AAT AAT TGG AAC ATC ATC AAT AAT TGG TTT 624	Tyr Ile Ser Gly Arg Ser Tyr Tyr Asn Asn Trp Asn Ile Ile Asn Asn Asn Trp Phe
AAC AAT GTC ACA CTT TTG TAT TCA CGC TCA AGC ACT GCT ACC ACC TGG GAA 672	Asn Asn Val Thr Leu Leu Tyr Tyr Ser Arg Ser Ser Thr Ala Thr Trp Glu

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**FIG. 7D**

GCA GAT GTA CAA TCT GGT ATG GGT ACA GTG TTT TCG TTG AAT ACA	1104
Ala Asp Val Gln Ser Gly Met Gly Ala Thr Val Phe Ser Leu Asn Thr	365
ACG GGT GGT GTC ATT CTT GAA GTT TCA TGT TAT AAT GAC ACA GTG AGT	1152
Thr Gly Gly Val Ile Leu Glu Val Ser Cys Tyr Asn Asp Thr Val Ser	380
GAG TCT AGT TTT TAC TAT GGT GAA ATT CCG TTC GGC ATA ACT GAT	1200
Glu Ser Ser Phe Tyr Ser Tyr Gly Gly Ile Glu Ile Pro Phe Gly Ile Thr Asp	400
GGA CCA CGG TAC TGT TAT GTA CTT TAC AAT GGC ACA GCT GCT AAG TAT	1248
Gly Pro Arg Tyr Cys Tyr Tyr Val Leu Tyr Asn Gly Thr Ala Leu Lys Tyr	415
TTA GGA ACA TTA CCA CCT AGT GTA CTT AAG GAA ATT GCT ATT AGT AAG TGG	1296
Leu Gly Thr Leu Pro Pro Pro Ser Val Val Lys Glu Ile Ala Ile Ser Lys Trp	430
GGC CAT TTT TAT ATT AAT GGT TAC TAT TTC TTT AGC ACA TTT CCT ATT	1344
Gly His Phe Tyr Ile Asn Gly Tyr Asn Phe Phe Ser Thr Phe Pro Ile	445
GAT TGT ATA TCT TTT AAC ACC ACT ACT GGT GAT AGT GGA GCT TTT TGG	1392
Asp Cys Ile Ser Phe Asn Thr Leu Thr Thr Gly Asp Ser Ser Ala Phe Trp	460
ACA ATT GCT TAC ACA TCG TAC ACT ACT GAG GCA TTA GTA CAA GAA AAC	1440
Thr Ile Ala Tyr Thr Ser Ser Tyr Thr Thr Glu Ala Leu Val Gln Glu Asn	480

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FIG. 7E

ACA GCT ATT AAA AAG GTG ACG TAT TGT AAC AGT CAC ATT AAT AAC ATT 1488	Thr Ala Ile Lys 485	Lys Lys Thr Val Thr Ala Thr Tyr Cys Asn Ser 490	AGT Ser His Ile Asn 495	ATT Ile Asn 495	ATT ATT 1488
AAG TGT TCT CAA CTT ACT GCT AAT AAT AAT GGA TTT TAT CCT GTT 1536	Lys Cys Ser Gln 500	Leu Thr Thr Ala Asn Leu Asn 505	AAT Asn Gly Phe Tyr Pro Val 510	TTT Phe Tyr Pro Val 510	TTT TAT CCT GTT 1536
GCT TCA AGT GAG GTT GGT CTT GTG AAT AAG AGT GTT GTG TTA TTA CCT 1584	Ala Ser Ser Glu 515	Val Val Gly Leu Val Asn Lys Ser Val Val 520	AGT Ser Val Val 525	GTG Val Val 525	TTA TTA CCT 1584
ATC TTT TTC GCA CAT ACC GCT ATC AAT ATA ACC ATT GAT CTT GGT ATG 1632	Ile Phe Phe Ala His Thr 535	Ala Ile Ile Asn Ile Thr 540	ACC Thr Thr 540	GAT Asp Leu Gly Met 540	CTT GGT ATG 1632
AAG CGT AGC GGT TAT GGT CAA CCC ATA GCA TCA ACA AGT AAC ATT 1680	Lys Arg Ser Gly Tyr 550	Gln Thr Gln Pro Ile Ala Ser 555	TCA Ser Thr 555	TTA Leu Ser Asn 560	AGT AAC ATT 1680
ACA CTA CCA ATG CAG GAT AAT AAC ACA GAT GTG TAC TGT ATT CGT TCT 1728	Thr Leu Pro Met 565	Met Gln Asp Asn Thr Asp 570	Val Val Thr Tyr 570	CGT Arg Ser 575	ATT CGT TCT 1728
AAC CAG TTT TCA GTT TAT GTT CAT TCT ATT TGT AAG AGT TCT TTA TGG 1776	Asn Gln Phe Ser 580	Thr Val Tyr Val His Ser 585	TGT Cys Lys 590	TTA TTA TGG 590	TTA TTA TGG 1776
GAC AAT ATT TTT AAT CAA GAA TGC ACG GAT GTT TTA GAT GCC ACA GCT 1824	Asp Asn Ile Phe 595	Asn Gln Glu Cys Thr Asp 600	Val Val Val Leu 605	GAT Asp Ala Thr Ala 605	ACA GCT 1824

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FIG. 7F

GTT Val	ATA Ile	AAG Lys	ACT Thr	GGT Gly	ACT Thr	TGT Cys	CCT Pro	TTC Phe	TCA Ser	TTT Phe	GAT Asp	AAA Lys	TTG Leu	AAC Asn	AAT Asn	1872
	610					615					620					
TAC Tyr	TTA Leu	ACT Thr	TTT Phe	AAC Asn	AAG Lys	TTC Phe	TGT Cys	TTG Leu	TCG Ser	TTG Leu	AGT Ser	CCT Pro	GTT Val	GGC Gly	GCT Ala	1920
625					630			635							640	
AAC Asn	TGC Cys	AAG Lys	TTT Phe	GAT Asp	GTT Val	GCC Ala	GCA Ala	CGT Arg	ACA Thr	AGA Arg	ACC Thr	AAT Asn	GAG Glu	CAA Gln	GTT Val	1968
				645				650						655		
GTT Val	AGA Arg	AGT Ser	CTA Leu	TAT Tyr	GTA Val	ATA Ile	TAT Tyr	GAA Glu	GAA Glu	GGA Gly	GAC Asp	AAC Asn	ATA Ile	GTT Val	GGT Gly	2016
			660					665					670			
GTA Val	CCG Pro	TCT Ser	GAT Asp	AAT Asn	AGC Ser	GGT Gly	CTG Leu	CAC His	GAT Asp	TTG Leu	TCT Ser	GTG Val	CTA Leu	CAC His	CTA Leu	2064
		675					680					685				
GAC Asp	TCC Ser	TGT Cys	ACA Thr	GAG Glu	TAT Tyr	AAT Asn	ATA Ile	TAT Tyr	GGT Gly	AGA Arg	ACT Thr	GGT Gly	GTT Val	GGT Gly	ATT Ile	2112
	690					695					700					
ATT Ile	AGA Arg	CAA Gln	ACT Thr	AAC Asn	AGT Ser	ACG Thr	CTA Leu	CTT Leu	AGC Ser	GGC Gly	TTA Leu	TAT Tyr	TAC Tyr	ACA Thr	TCA Ser	2160
705					710					715					720	
CTA Leu	TCA Ser	GGT Gly	GAT Asp	TTG Leu	TTA Leu	GGC Gly	TTT Phe	AAA Lys	AAT Asn	GTT Val	AGT Ser	GAT Asp	GGT Gly	GTC Val	ATC Ile	2208
				725					730					735		

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# FIG. 7G

TAT Tyr	TCT Ser	GTG Val	ACG Thr	CCA Pro	TGT Cys	GAT Asp	GTA Val	AGC Ser	GCA Ala	CAA Gln	GCG Ala	4CT Ala	GTT Val	ATT Ile	GAT Asp	2256
			740					745					750			
GGT Gly	GCC Ala	ATA Ile	GTT Val	GGA Gly	GCT Ala	ATG Met	ACT Thr	TCC Ser	ATT Ile	AAC Asn	AGT Ser	GAA Glu	CTG Leu	TTA Leu	GGT Gly	2304
		755					760					765				
CTA Leu	AAA Lys	CAC His	TGG Trp	ACA Thr	ACA Thr	ACA Thr	CCT Pro	AAT Asn	TTF Phe	TAT Tyr	TAC Tyr	TAC Tyr	TCT Ser	ATA Ile	TAT Tyr	2352
							775									
AAT Asn	TAT Tyr	ACA Thr	AAT Asn	GAG Glu	AGG Arg	ACT Thr	CGT Arg	GGC Gly	ACT Thr	GCA Ala	ATT Ile	GAC Asp	AGT Ser	AAC Asn	GAT Asp	2400
					790						795					800
GTT Val	GAT Asp	TGT Cys	GAA Glu	CCT Pro	ATC Ile	ATA Ile	ACC Thr	TAT Tyr	TCT Ser	AAC Asn	ATA Ile	GGT Gly	GTT Val	TGT Cys	AAA Lys	2448
					805				810					815		
AAT Asn	GGT Gly	GCT Ala	TTG Leu	GTT Val	TTT Phe	ATT Ile	AAC Asn	GTC Val	ACA Thr	CAT His	TCT Ser	GAT Asp	GGA Gly	GAC Asp	GTG Val	2496
			820					825					830			
CAA Gln	CCA Pro	ATT Ile	AGC Ser	ACT Thr	GGT Gly	ACT Thr	GTC Val	ACG Thr	ATA Ile	CCT Pro	ACA Thr	AAC Asn	TTT Phe	ACC Thr	ATA Ile	2544
			835				840					845				
TCT Ser	GTG Val	CAA Gln	GTC Val	GAA Glu	TAC Tyr	ATT Ile	CAG Gln	GTT Val	ACC Tyr	CCT Thr	ACA Thr	CCA Pro	GTA Val	TCA Ser	ATA Ile	2592
						855						860				

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FIG. 7H

GAT TGT GCA AGA TAC GTT TGC AAT GGT AAC CCT AGA TGT AAC AAA TTG	2640
Asp Cys Ala Arg Tyr Val Cys Asn Gly Asn Pro Arg Cys Asn Lys Leu	880
865	
TTA ACA CAA TAT GTT TCT GCA TGT CAA ACT ATT GAG CCA GCA CTT GCA	2688
Leu Thr Gln Tyr Val Ser Ala Cys Gln Thr Ile Glu Gln Ala Leu Ala	895
885	
ATG GGT GCC AGA CTT GAA AAC ATG GAG GGT GAT TCC ATG TTT TTC GTT	2736
Met Gly Ala Arg Leu Glu Gln Asn Met Glu Val Asp Ser Met Leu Phe Val	910
900	
TCT GAA AAT GCC CTT AAA TTG GCA TCT GGT GAG GCG TTC AAT AGT ACA	2784
Ser Glu Asn Ala Leu Lys Leu Ala Ser Val Glu Ala Phe Asn Ser Thr	925
915	
GAA AAT TTA GAC CCT ATT TAC AAA GAA TGG CCT AAC ATA GGT GGT TCT	2832
Glu Asn Leu Asp Pro Ile Tyr Lys Glu Trp Pro Asn Ile Gly Gly Ser	940
930	
TGG TTA GGA GGT TTA AAA GAC ATA CTG CCG TCC CAT AAT AGC AAA CGT	2880
Trp Leu Gly Gly Leu Lys Asp Ile Leu Pro Ser His Asn Ser Lys Arg	955
945	
AAG TAT CGT TCT GCT ATA GAA GAC TTT GAT AAQ GTT GTA ACT	2928
Lys Tyr Arg Ser Ala Ile Glu Asp Leu Leu Phe Asp Lys Val Val Thr	970
965	
TCT GGT TTA GGT ACA GTT GAT GAA GAT TAT AAA CGT TGT ACA GGT GGT	2976
Ser Gly Leu Gly Thr Val Asp Glu Asp Tyr Lys Arg Cys Thr Gly Gly	980
985	

FIG. 7I

TAT GAC ATA GCC GAC TTA GTG TGT GCT CAA TAT TAC AIT GGC ATC ATG	3024
Tyr Asp Ile Ala Asp Val Cys Ala Gln Tyr Tyr Asn Gly Ile Met	1005
995	
GTG TTA CCT GGT GTA GCT AAT GAT GAC AAG ATG ACT ATG TAC ACA GCA	3072
Val Leu Pro Gly Val Ala Asn Asp Asp Lys Met Thr Tyr Thr Ala	1020
1010	
TCT CTT GCA GGT GGT ATA ACA CTA GGT GCA CTT GGT GGT GCC GGT	3120
Ser Leu Ala Gly Gly Ile Thr Leu Gly Ala Leu Gly Gly Ala Val	1035
1025	
GCT ATA CCT TTT GCA GTA GCA GTT CAA GCT AGA CTT AAT AAT GGT GCT	3168
Ala Ile Pro Phe Ala Val Ala Val Gln Ala Arg Leu Asn Tyr Val Ala	1050
1045	
CTA CAA ACT GAT GTA TTG AAT AAA AAC CAG CAG ATC CTG GCT AAT GCT	3216
Leu Gln Thr Asp Val Leu Asn Lys Asn Gln Gln Ile Leu Ala Asn Ala	1070
1060	
TTC AAT CAA GCT ATT GGT AAC ATT ACA CAG GCA TTT GGC AAG GTT AAT	3264
Phe Asn Gln Ala Ile Gly Asn Ile Thr Gln Ala Phe Gly Lys Val Asn	1080
1075	
GAT GCT ATA CAT CAA ACA TCA AAA GGT CTT GCA ACT GTT GCT AAA GCA	3312
Asp Ala Ile His Gln Thr Ser Lys Gly Leu Ala Thr Val Ala Lys Ala	1100
1090	
TTG GCA AAA GTG CAA GAT GTT GTC AAC ACA CAA GGG CAA GCT TTA AGC	3360
Leu Ala Lys Val Gln Asp Val Val Asn Thr Gln Gly Gld Ala Leu Ser	1110
1105	
	1115
	1120

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**FIG. 7J**

CAC CTA ACA GTA CAA TTG CAA AAT AAT TTT CAA GCC ATT AGT AGC TCT	3408
His Leu Thr Val Gln Leu Gln Asn Asn Phe Gln Ala Ile Ser Ser	1135
	1130
ATT AGT GAT ATT TAT AAC AGG CTT GAC GAA CTG AGT GCT GAT GCA CAA	3456
Ile Ser Asp Ile Tyr Asn Arg Leu Asp Glu Leu Ser Ala Asp Ala Gln	1150
	1145
	1140
GTT GAT AGG CTG ATT ACA GGA AGA CTT ACA GCA CTT AAT GCA TTT GTG	3504
Val Asp Arg Leu Ile Thr Arg Gly Thr Leu Thr Ala Leu Asn Ala Phe Val	1165
	1155
TCT CAG ACT CTA ACC AGA CAA GCG GAG GTT AGG GCT AGT AGA CAA CTT	3552
Ser Gln Thr Leu Thr Arg CAA Gln Ala Glu Val Arg Ala Ser Arg Gln Leu	1180
	1175
	1170
GCC AAG GAC AAG GTT AAT GAA TGT GTT AGA TCC CAA TCT CAG AGA TTT	3600
Ala Lys Asp Lys Val Asn Glu Cys Val Arg Ser Gln Ser Gln Arg Phe	1200
	1195
	1190
GGA TTC TGT GGT AAT GGT ACA CAC TTG TTT TCA CTT GCA AAT GCA GCA	3648
Gly Phe Cys Gly Asn Gly Thr His Leu Phe Ser Leu Ala Asn Ala Ala	1215
	1205
	1200
CCA AAT GGC ATG ATT TTC TTT CAT ACA GTG CTA TTA CCA ACG GCT TAT	3696
Pro Asn Gly Met Ile Phe Phe His Thr Val Leu Leu Pro Thr Ala Tyr	1230
	1225
	1220
GAA ACT GTA ACA GCT TGG CCA GGT ATT TGT GCT TCA GAT GGC GAT CGC	3744
Glu Thr Val Thr Ala Trp Pro Gly Ile cys Ala Ser Asp Gly Asp Arg	1245
	1240
	1235

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# FIG. 7K

ACT TTT GGA CTT GTC GTT AAA GAT GTA CAG TTG ACG TTG TTT CGT AAC	3792
Thr Phe Gly Leu Val Val Lys Asp Val Gln Leu Thr Leu Phe Arg Asn	
1250	1260
CTA GAT GAC AAG TTC TAT TTG ACT CCC AGA ACT ATG TAT CAG CCT AGA	3840
Leu Asp Asp Lys Phe Tyr Leu Thr Pro Arg Thr Met Tyr Gln Pro Arg	
1265	1275
GCT GCA ACT AGT TCT GAT TTT GTT CAA ATT GAG GGG TGC GAT GTG TTG	3888
Ala Ala Thr Ser Ser Asp Phe Val Gln Ile Glu Gly Cys Asp Val Leu	
	1290
TTT GTC AAT GCA ACT GAT GTA ATT GAC TTG CCT AGT ATT ATA CCT GAC TAT	3936
Phe Val Asn Ala Thr Val Ile Asp Leu Pro Ser Ile Ile Pro Asp Tyr	
	1300
ATT GAC ATC AAT CAG ACT GAT CAA GAT ATA TTA GAA AAT TAC AGA CCA	3984
Ile Asp Ile Asn Gln Thr Val Gln Asp Ile Leu Glu Asn Tyr Arg Pro	
	1315
AAC TGG ACT GTA CCT GAA TTG ACA CTT GAT ATT TTT AAC GCA ACC TAT	4032
Asn Trp Thr Val Pro Glu Leu Thr Thr Leu Asp Ile Phe Asn Ala Thr Tyr	
	1330
TTA AAT CTG ACT GGT GAA ATT GAT GAC TTA GAA TTT AGG TCA GAA AAG	4080
Leu Asn Leu Thr Gly Glu Ile Asp Asp Leu Glu Phe Arg Ser Glu Lys	
1345	1355
CTA CAC AAT ACC ACT GAT GAA CTT GCC ATT CTC ATT GAC AAC ATT AAC	4128
Leu His Asn Thr Thr Val Glu Leu Ala Ile Leu Ile Asp Asn Ile Asn	
	1365
	1370
	1375



4365



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FIG. 8

UCD-2, nucleotides 1- 377 [SEQ ID NO:53]  
UCD-2, amino acids 1- 125 [SEQ ID NO:54]

AAT	GCT	CGT	GGT	AAA	CCA	TTA	TTA	TTT	CAT	GTG	CAT	GGT	GAG	CCT	GTT	48
Asn	Ala	Arg	Gly	Lys	Pro	Leu	Leu	Phe	His	Val	His	Gly	Glu	Pro	Val	
1				5				10					15			
AGT	GTT	ATT	ATA	TAT	ATA	TCG	GCT	TAT	AGG	GAT	GAT	GTG	CAA	CAA	AGG	96
Ser	Val	Ile	Ile	Tyr	Ile	Ser	Ala	Tyr	Arg	Asp	Asp	Val	Gln	Gln	Arg	
				20				25					30			
CCC	CTT	TTA	AAA	CAT	GGG	TTA	GTG	TGC	ATA	ACT	AAA	AAT	CGC	CAT	ATT	144
Pro	Leu	Leu	Lys	His	Gly	Leu	Val	Cys	Ile	Thr	Lys	Asn	Arg	His	Ile	
				35			40					45				
AAC	TAT	GAA	CAA	TTC	ACC	TCC	AAC	CAG	TGG	AAT	TCC	ACA	TGT	ACG	GGT	192
Asn	Tyr	Glu	Gln	Phe	Thr	Ser	Asn	Gln	Trp	Asn	Ser	Thr	Cys	Thr	Gly	
						55				60						
GCT	GAC	AGA	AAA	ATT	CCT	TTC	TCT	GTC	ATA	CCC	ACG	GAC	AAT	GGA	ACA	240
Ala	Asp	Arg	Lys	Ile	Pro	Phe	Ser	Val	Ile	Pro	Thr	Asp	Asn	Gly	Thr	
					70					75					80	
AAA	ATC	TAT	GGT	CTT	GAG	TGG	AAT	GAT	GAC	TTT	GTT	ACA	GCT	TAT	ATT	288
Lys	Ile	Tyr	Gly	Leu	Glu	Trp	Asn	Asp	Asp	Phe	Val	Thr	Ala	Tyr	Ile	
				85					90					95		
AGT	GGT	CGT	TCT	TAT	CAC	TTG	AAC	ATC	AAT	ACT	AAT	TGG	TTT	AAC	AAT	336
Ser	Gly	Arg	Ser	Tyr	His	Leu	Asn	Ile	Asn	Thr	Asn	Trp	Phe	Asn	Asn	
				100				105					110			
GTC	ACA	CTT	TTG	TAT	TCA	CGC	TCA	AGC	ACT	GCT	ACC	TGG	GA			377
Val	Thr	Leu	Leu	Tyr	Ser	Arg	Ser	Ser	Thr	Ala	Thr	Trp				
				115			120					125				

**FIG. 9A**

Consensus Sequence													
Nucleotides 1- 2246 [SEQ ID NO:33]													
Amino acids 1- 748 [SEQ ID NO:34]													
ATG	ATT	GTG	CTC	GTA	ACT	TGC	CTC	TTG	TTG	TTA	TGT	TCA	39
Met	Ile	Val	Leu	Val	Thr	Cys	Leu	Leu	Leu	Leu	Cys	Ser	
1				5					10				
TAC	CAC	ACA	GTT	TTG	AGT	ACA	ACA	AAT	AAT	GAA	TGC	ATA	78
Tyr	His	Thr	Val	Leu	Ser	Thr	Thr	Asn	Asn	Glu	Cys	Ile	
	15					20					25		
CAA	GTT	AAC	GTA	ACA	CAA	TTG	GCT	GGC	AAT	GAA	AAC	CTT	117
Gln	Val	Asn	Val	Thr	Gln	Leu	Ala	Gly	Asn	Glu	Asn	Leu	
				30				35					
ATC	AGA	GAT	TTT	CTG	TTT	AGT	AAC	TTT	AAA	GAA	GAA	GGA	156
Ile	Arg	Asp	Phe	Leu	Phe	Ser	Asn	Phe	Lys	Glu	Glu	Gly	
40					45					50			
AGT	GTA	GTT	GTT	GGT	GGT	TAT	TAC	CCT	ACA	GAG	GTG	TGG	195
Ser	Val	Val	Val	Gly	Gly	Tyr	Tyr	Pro	Thr	Glu	Val	Trp	
				55			60					65	
TAC	AAC	TGC	TCT	AGA	ACA	GCT	CGA	ACT	ACT	GCC	TTT	CAG	234
Tyr	Asn	Cys	Ser	Arg	Thr	Ala	Arg	Thr	Thr	Ala	Phe	Gln	
				70					75				
TAT	TTT	AAT	AAT	ATA	CAT	GCC	TTT	TAT	TTT	GTT	ATG	GAA	273
Tyr	Phe	Asn	Asn	Ile	His	Ala	Phe	Tyr	Phe	Val	Met	Glu	
				80		85					90		

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**FIG. 9B**

GCC ATG GAA AAT AGC ACT GGT AAT GCA CGT GGT AAA CCA 312	Ala Met Glu Asn Ser Thr Gly Asn Ala Arg Gly Lys Pro
TTA TTA TTT CAT GTG CAT GGT GAG CCT GTT AGT GTT ATT 351	Leu Leu Phe His Val His Gly Glu Pro Val Ser Val Ile
ATA TAT ATA TCG GCT TAT AGG GAT GAT GTG CAA AGG 390	Ile Tyr Ile Ser Ala Tyr Arg Asp Asp Val Gln Gln Arg
CCC CTT TTA AAA CAT GGG TTA GTG TGC ATA ACT AAA AAT 429	Pro Leu Leu Lys His Gly Leu Val Cys Ile Thr Lys Asn
CGC CAT ATT AAC TAT GAA CAA TTC ACC TCC AAC CAG TGG 468	Arg His Ile Asn Tyr Glu Gln Phe Thr Ser Asn Gln Trp
AAT TCC ACA TGT ACG GGT GCT GAC AGA AAA ATT CCT TTC 507	Asn Ser Thr Cys Thr Gly Ala Asp Arg Lys Ile Pro Phe
TCT GTC ATA CCC ACG GAC AAT GGA ACA AAA ATC TAT GGT 546	Ser Val Ile Pro Thr Asp Asn Gly Thr Lys Ile Tyr Gly
CTT GAG TGG AAT GAT GAC TTT GTT ACA GCT TAT ATT AGT 585	Leu Glu Trp Asn Asp Phe Val Thr Ala Tyr Ile Ser

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## FIG. 9C

GGT Gly	CGT Arg	TCT Ser	TAT Tyr	CAC His	TTG Leu	AAC Asn	ATC Ile	AAT Asn	ACT Thr	AAT Asn	TGG Trp	TTT Phe	624
				200					205				
AAC Asn	AAT Asn	GTC Val	ACA Thr	CTT Leu	TTG Leu	TAT Tyr	TCA Ser	CGC Arg	TCA Ser	AGC Ser	ACT Thr	GCT Ala	663
	210					215					220		
ACC Thr	TGG Trp	GAA Glu	TAC Tyr	AGT Ser	GCT Ala	GCA Ala	TAT Tyr	GCT Ala	TAC Tyr	CAA Gln	GGT Gly	GTT Val	702
			225					230					
TCT Ser	AAC Asn	TTC Phe	ACT Thr	TAT Tyr	TAC Tyr	AAG Lys	TTA Leu	AAT Asn	AAC Asn	ACC Thr	AAT Asn	GGT Gly	741
235					240					245			
CTA Leu	AAA Lys	ACC Thr	TAT Tyr	GAA Glu	TTA Leu	TGT Cys	GAA Glu	GAT Asp	TAT Tyr	GAA Glu	CAT His	TGC Cys	780
		250					255					260	
ACT Thr	GGC Gly	TAT Tyr	GCT Ala	ACC Thr	AAT Asn	GTA Val	TTT Phe	GCT Ala	CCG Pro	ACA Thr	TCA Ser	GGT Gly	819
				265					270				
GGT Gly	TAC Tyr	ATA Ile	CCT Pro	GAT Asp	GGA Gly	TTT Phe	AGT Ser	TTT Phe	AAY Asn	AAT Asn	TGG Trp	TTC Phe	858
	275					280					285		

FIG. 9D

TTG CTT ACA AAT AGT TCC ACT TTT GTT AGT GGC AGG TTT	897
Leu Leu Thr Asn Ser 290	
	295
GTA ACA AAT CAA CCA TTA TTG ATT AAT TGC TTG TGG CCA	936
Val Thr Asn Gln Pro 305	
300	310
GTG CCC AGT TTT GGT GTA GCA GCA CAA GAA TTT TGT TTT	957
Val Pro Ser Phe 315	
	320
	325
GAA GGT GCA CAG TTT AGC CAA TGT AAT GGT GTG TCT TTA	1014
Glu Gly Ala Gln Phe 330	
	335
AAT AAC ACA GTG GAT GTT ATT AGA TTC AAC CTT AAT TTC	1053
Asn Asn Thr Val Asp 340	
	345
	350
ACT GCA GAT GTA CAA TCT GGT ATG GGT GCT ACA GTA TTT	1092
Thr Ala Asp Val Gln Ser 355	
	360
TCA CTG AAT ACA ACA GGT GGT GTC ATT CTT GAA ATT TCA	1131
Ser Leu Asn Thr 370	
365	375
TGT TAT AGT GAC ACA GTG AGT AGT TCT TAC AGT	1170
Cys Tyr Ser Asp Thr Val Ser 385	
380	390

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FIG. 9E

TAT GGT GAA ATC CCG TTC GGC ATA ACT GAC GGA CCA CGA	1209
Tyr Gly Glu Ile Pro Phe Gly Ile Thr Asp Gly Pro Arg	400
TAC TGT TAT GTA CTT TAC TAT AAT GGC ACA GCT CTT AAA TAT	1248
Tyr Cys Tyr Val Leu Tyr Tyr Asn Gly Thr Ala Leu Lys Tyr	415
TTA GGA ACA TTA CCA CCC AGT GTA AAG GAA ATT GCT ATT	1287
Leu Gly Thr Leu Pro Pro Ser Val Lys Glu Ile Ala Ile	425
AGT AAG TGG GGC CAT TTT TAT TAT ATT AAT GGT TAC AAT TTC	1326
Ser Lys Trp Gly His Phe Tyr Ile Asn Gly Tyr Asn Phe	440
TTT AGC ACA TTT CCT ATT GRT TGT ATA TCT TTT AAT TTA	1365
Phe Ser Thr Phe Pro Ile Xaa Cys Ile Ser Phe Asn Leu	455
ACC ACT GGT GTT AGT GGA GCT TTT TGG ACA ATT GCT TAC	1404
Thr Thr Gly Val Ser Gly Ala Phe Trp Thr Ile Ala Tyr	465
ACA TCG TAT ACT GAA GCA TTA GTA CAA GTT GAA AAC ACA	1443
Thr Ser Tyr Thr Glu Ala Leu Val Val Glu Asn Thr	480
GCT ATT AAA AAT GTG ACG TAT TGT AAC AGT CAC ATT AAT	1482
Ala Ile Lys Asn Val Thr Tyr Cys Asn Ser His Ile Asn	490

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**FIG. 9F**

AAC Asn 495	ATT Ile	AAA Lys	TGT Cys	TCT Ser	CAA Gln 500	CTT Leu	ACT Thr	GCT Ala	AAT Asn	TTG Leu 505	AAT Asn	AAT Asn	1521
GGA Gly	TTT Phe	TAT Tyr 510	CCT Pro	GTT Val	GCT Ala	TCA Ser	AGT Ser 515	GAA Glu	GTA Val	GGT Gly	TTC Phe	GTT Val 520	1560
AAT Asn	AAG Lys	AGT Ser	GTT Val	GTG Val 525	TTA Leu	TTA Leu	CCT Pro	AGC Ser	TTT Phe 530	TTC Phe	ACA Thr	TAC Tyr	1599
ACC Thr	GCT Ala 535	GTC Val	AAT Asn	ATA Ile	ACC Thr	ATT Ile 540	GAT Asp	Leu	GGT Gly	ATG Met	AAG Lys 545	CTT Leu	1638
AGT Ser	GGT Gly 550	TAT Tyr	GGT Gly 550	CAA Gln	CCC Pro	ATA Ile	GCC Ala 555	TCG Ser	ACA Thr	CTA Leu	AGT Ser	AAC Asn	1677
ATC Ile 560	ACA Thr	CTA Leu	CCA Pro	ATG Met	CAG Gln 565	GAT Asp	AAC Asn	AAT Asn	ACT Thr	GAT Asp 570	GTG Val	TAC Tyr	1716
TGT Cys	ATT Ile	CGT Arg 575	TCT Ser	AAC Asn	CAA Gln	TTC Phe	TCA Ser 580	GTT Val	TAT Tyr	GTT Val	CAT His 585	TCC Ser	1755
ACT Thr	TGC Cys	AAA Lys	AGT Ser	TCT Ser 590	TTA Leu	TGG Trp	GAC Asp	AAT Asn	ATT Ile 595	TTT Phe	AAT Asn	CAA Gln	1794

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**FIG. 9G**

GAC Asp 600	TGC Cys 600	ACG Thr 600	GAT Asp 600	GTT Val 600	TTA Leu 600	GAG Glu 605	GCT Ala 605	ACA Thr 605	GCT Ala 605	GTT Val 610	ATA Ile 610	AAA Lys 610	1833
ACT Thr 615	GGT Gly 615	ACT Thr 615	TGT Cys 615	CCT Pro 615	TTC Phe 615	TCA Ser 615	TTT Phe 615	GAT Asp 620	AAA Lys 620	TTG Leu 620	AAC Asn 620	AAT Asn 620	1872
TAC Tyr 625	TTG Leu 625	ACT Thr 625	TTT Phe 625	AAC Asn 630	AAG Lys 630	TTC Phe 630	TGT Cys 630	TTG Leu 635	TCG Ser 635	TTG Leu 635	AGT Ser 635	CCT Pro 635	1911
GTT Val 640	GGT Gly 640	GCT Ala 640	AAT Asn 640	TGC Cys 645	AAG Lys 645	TTT Phe 645	GAT Asp 645	GTT Val 645	GCT Ala 645	GCA Ala 650	CGT Arg 650	ACA Thr 650	1950
AGA Arg 655	ACC Thr 655	AAT Asn 655	GAG Glu 655	CAG Gln 655	GTT Val 655	GTT Val 660	AGA Arg 660	AGT Ser 660	CTA Leu 660	TAT Tyr 660	GTA Val 660	ATA Ile 660	1989
TAT Tyr 665	GAA Glu 665	GAA Glu 665	GGA Gly 665	GAC Asp 665	AAC Asn 670	ATA Ile 670	GTG Val 670	GGT Gly 670	GTA Val 675	CCG Pro 675	TCT Ser 675	GAT Asp 675	2028
RAT Xaa 680	AGC Ser 680	GGT Gly 680	CTG Leu 680	CAC His 680	GAT Asp 685	TTG Leu 685	TCT Ser 685	GTG Val 685	CTA Leu 685	CAC His 685	CTA Leu 685	GAC Asp 685	2067
TCC Ser 690	TGT Cys 690	ACA Thr 690	GAT Asp 690	TAC Tyr 695	AAT Asn 695	ATA Ile 695	TAT Tyr 695	GGT Gly 695	AGA Arg 695	ACT Thr 700	GGT Gly 700	GTT Val 700	2106

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TGT GAT GTA AGC GCA CAA GCG GC  
Cys Asp Val Ser Ala Gln Ala  
745